METEOROLOGY GROUP

DOCUMENT 385-99

STANDARDS FOR EXCHANGE OF UPPER AIR METEOROLOGICAL DATA BETWEEN RANGES

WHITE SANDS MISSILE RANGE
KWAJALEIN MISSILE RANGE
YUMA PROVING GROUND
DUGWAY PROVING GROUND
ABERDEEN TEST CENTER
NATIONAL TRAINING CENTER

ATLANTIC FLEET WEAPONS TRAINING FACILITY
NAVAL AIR WARFARE CENTER WEAPONS DIVISION
NAVAL AIR WARFARE CENTER AIRCRAFT DIVISION
NAVAL UNDERSEA WARFARE CENTER DIVISION, NEWPORT
PACIFIC MISSILE RANGE FACILITY
NAVAL UNDERSEA WARFARE CENTER DIVISION, KEYPORT

30TH SPACE WING
45TH SPACE WING
AIR FORCE FLIGHT TEST CENTER
AIR ARMAMENT CENTER
AIR WARFARE CENTER
ARNOLD ENGINEERING DEVELOPMENT CENTER
GOLDWATER RANGE
UTAH TEST AND TRAINING RANGE

Report Documentation Page

Form Approved
OMB No. 0704-0188

1. REPORT DATE	2. REPORT TYPE	3. DATES COVERED
31 AUG 1999		**00-01-1998 to 00-07-1999**

4. TITLE AND SUBTITLE	5a. CONTRACT NUMBER
Standards for Exchange of Upper Air Meteorological Data Between Ranges	5b. GRANT NUMBER
	5c. PROGRAM ELEMENT NUMBER
6. AUTHOR(S)	5d. PROJECT NUMBER
	5e. TASK NUMBER
	5f. WORK UNIT NUMBER
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) **Range Commanders Council,1510 Headquarters Avenue,White Sands Missile Range,NM,88002**	8. PERFORMING ORGANIZATION REPORT NUMBER **358-99**
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)	10. SPONSOR/MONITOR'S ACRONYM(S)
	11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release; distribution unlimited

13. SUPPLEMENTARY NOTES

14. ABSTRACT
A guide for the orderly implementation and application of upper air measurement systems for both the DoD ranges and range users. Provides the necessary criteria on which to base equipment design and modification.

15. SUBJECT TERMS
Meteorology Group; WMO Form 94 BUFR; NASA Meteorological Data;

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a REPORT	b ABSTRACT	c THIS PAGE			
unclassified	**unclassified**	**unclassified**	**Same as Report (SAR)**	**8**	

STANDARDS FOR EXCHANGE OF UPPER AIR METEOROLOGICAL DATA BETWEEN RANGES

31 AUGUST 1999

Prepared by

METEOROLOGY GROUP
RANGE COMMANDERS COUNCIL

Published by

Secretariat
Range Commanders Council
U.S. Army White Sands Missile Range
New Mexico 88002-5110

TABLE OF CONTENTS

Chapter 1: Introduction

1.1 General

The Meteorology Group (MG) of the Range Commanders Council (RCC) has prepared this document to foster the compatibility of the transmission, reception, and decoding of upper air meteorological data at the member ranges under the cognizance of the RCC. It is highly recommended that meteorological equipment operated by the ranges, and used in programs that require test support, conform to these standards.

1.2 Scope

These standards do not necessarily define the existing capability of any test range, but constitute a guide for the orderly implementation and application of upper air measurement systems for both the ranges and range users. A variety of upper air measurement systems are currently in use at the ranges including rawinsondes, Doppler radar wind profilers, and sound detection and ranging (sodar) systems. Any standard should be able to adequately encode the data from these systems with the resolution and accuracy needed for various customers. In addition, the standards should recognize that meteorological equipment is evolving and that new capabilities will be available in the future. It is anticipated that the two standards documented here should be capable of handling upper air data from both current range equipment and future systems.

1.3 Purpose

These standards provide the necessary criteria on which to base equipment design and modification. The ultimate purpose is to ensure interoperability between ranges, compatibility of range user equipment with the ranges, and efficient and effective transmission of data to range customers.

1.4 Reference Documents

Reference documents are identified in the appropriate chapters.

1.5 Definitions

Commonly used terms are defined in the standard meteorological glossaries and in RCC Document 351-97, A Glossary of Selected Meteorological Terms.

1.6 General Statements and Requirements

The following two chapters provide references for the two standards. In addition, these chapters include discussions of the advantages and disadvantages of each format.

Chapter 2: WMO Form 94 BUFR

2.1 General Description

World Meteorological Organization (WMO) Form 94, Binary Universal Form for the Representation of meteorological data (BUFR), is a binary format designed to encode any meteorological data. A BUFR message consists of 5 sections. These sections provide all information about the data in the message including the type of data, a description of the data that will follow including the parameter, the units of measure, and the scaling and the actual meteorological data. The standardization and interoperability of the data are ensured through the use of standardized tables for the data types and descriptions. These tables also provide the flexibility to accommodate new upper air systems in the future.

2.2 References

a. WMO Manual On Codes, Volume 1, Part B, Publication No. 306.

b. A Guide to WMO Code Form FM 94 BUFR (FCM-I6-1995)

2.3 Advantages

The use of the standard tables, and modification of the tables, allows the format to accommodate change and the implementation of new observing systems. The binary format allows the message to be easily decoded by computers. In addition, the ease and speed of conversion into numeric format can allow computer decoding programs to run more efficiently. The data format is fairly compact and is, in general, smaller than an equivalent ASCII file.

2.4 Disadvantages

The binary format is not easily viewed by humans. This format also requires well designed decoding software that recognizes the appropriate BUFR tables.

Chapter 3: NASA Meteorological Data Transfer Format

3.1 General

The NASA Meteorological Data Transfer Format (MDTF) is an ASCII text format. A message consists of a series of lines of data with each line consisting of up to 80 characters. The MDTF format is currently used at the 30th and 45th Space Wings, White Sands Missile Range, and Air Force Flight Test Center for support of not only NASA but other customers. The MDTF document has defined message formats for the following upper air systems: low resolution amps, high resolution amps, jimspheres, rawinsondes, Doppler radar wind profilers, and Radio Acoustic Sounding Systems (RASS) virtual temperature profiles.

3.2 Reference

JSC-22955, Meteorological Data Transfer Format for Space Shuttle Mission Support.

3.3 Advantages

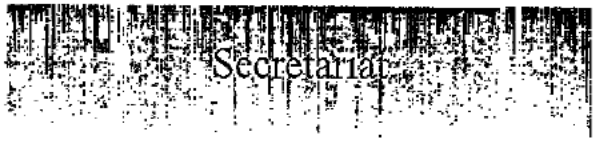
The ASCII formatted message can be easily read by humans allowing for easy quality control and interpretation of the raw data. The MDTF documentation has defined formats for several types of observing systems in use at the ranges. Customers are often more comfortable with this format, and many range customers have decoders specifically written to handle it.

3.4 Disadvantages

Formats for new observing systems will have to be defined in the future if the data is not well represented by existing codes. This format technically limits a message line to 80 characters in length including an end-of-line character. All messages may not easily fit into this length. See, for example, the 915-MHz profiler system wind data format described in the MDTF document. Decoding software will also have to be developed for any new observing systems for which new formats are defined.

Chapter 4: Conclusions

The MG recommends two different formats for upper air meteorological data standards. The choice of these two formats recognizes the fact that a de facto standard has evolved at the ranges and that meteorological data is used by a variety of customers with differing needs. The de facto standard is a text based format known by various names, but which will be referred to in this document as the NASA Meteorological Data Transfer Format (MDTF). The second standard is the code recommended by the Office of the Federal Coordinator for Meteorology which applies to the dissemination of data between federal agencies – the Binary Universal Form for Representation of meteorological data (BUFR). These two formats should provide the flexibility to meet the needs of all users of meteorological data. These formats are also sufficiently documented such that this standard will merely reference existing documents describing the standards.



RANGE COMMANDERS COUNCIL

ATTN: STEWS-RCC
WHITE SANDS MISSILE RANGE, NEW MEXICO 88002-5110

OFFICIAL BUSINESS